

*Professor W. Fleming Esq.  
from the Author*

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A LETTER

TO

THE HONOURABLE THE  
LORD PROVOST, MAGISTRATES,  
AND COUNCILLORS

OF

GLASGOW,

ON

THE PUBLIC WELLS.



TO THE HONOURABLE THE  
**Lord Provost, Magistrates, and Councillors**  
OF THE CITY OF GLASGOW.

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GENTLEMEN,

Some days since I was favoured with a copy of your Committee's pamphlet on the Public Wells of Glasgow, containing Reports by Dr. Robert Dundas Thomson, (chemical assistant to Dr. Thomas Thomson, our distinguished Professor of Chemistry in the College,) and Dr. Frederick Penny, Professor of Chemistry in the Andersonian Institution.

Observing in the newspapers that the subject of these wells is still occupying the attention of your honourable Board, and conceiving that many of the statements in this pamphlet are likely to mislead your judgment, and to create unnecessary and even mischievous alarm in the minds of the citizens of Glasgow, I beg leave to solicit the indulgence of addressing you on the nature and value of the chemical evidence and medical opinions which have been given with regard to the ingredients and the sanatory influence of the water of these wells.

If this printed document of your Committee concerned matters of a private nature, however important, I should feel the impropriety of obtruding upon you the opinions of an anonymous correspondent, and I should have sought some other means and opportunity of expressing my sentiments on the erroneous assertions and mistaken views which it contains. It is, however, because I consider this pamphlet involves a question of public interest; because the public

itself seems so to consider it; because its contents are purely of a scientific character; because, not in this city only, but in other and distant places, and by competent judges, a part of the Report has been strongly animadverted upon and condemned; and because your pursuits and engagements in life cannot have qualified you for estimating the value of scientific details, or for detecting scientific fallacies. It is for these reasons that I presume to hope for your attentive consideration, even if I deviate in some degree from the common course, and offer you my opinions in a manner which I confess to be unusual, and perhaps irregular.

At the same time, I trust I shall not be accused of abusing the indulgence by freely discussing the statements that have been made, or be suspected of being actuated by motives inimical to any individual; but that I shall be credited when I affirm that I am influenced solely by considerations of public utility, and of rendering an essential service to the community of Glasgow. The pamphlet consists of three parts. The first part contains the Report of the Sub-committee; the second that of Dr. R. D. Thomson; and the third, the Report of Dr. F. Penny.

Now the chief question, I apprehend, in which the public is concerned is: Whether the waters of the wells in Glasgow are wholesome, and suitable to be used as a beverage? or whether they contain any substance or substances which render their use in this respect improper and hazardous? I pass over, therefore, the first part of the pamphlet, as it merely gives a list of the wells in the several districts; and I come at once to the sanatory and chemical evidence contained in the Reports of the two Doctors.

It must, I am sure, be matter for common regret, that these authorities are at complete variance on the most essential point, and have given diametrically opposite opinions on the sanatory influence of these waters.

Dr. R. D. Thomson asserts that they "contain in solution a portion of human excretions," and hints that their influence may be as destructive and fatal as "small-pox matter on

a lancet-point ;” while Dr. Penny affirms that the six samples which he analyzed, “are free from injurious metallic impregnations, and from every ingredient that can prove hurtful to health or animal life.”

Fortunately for you, Gentlemen, and for the public of Glasgow, a part of the question has been taken up, and satisfactorily settled, by Mr. Lewis Thompson, a chemist and medical man near Newcastle. In a letter (of which I annex a copy for your perusal) addressed to the Editor of the “Pharmaceutical Times,” and published in that journal, he completely refutes Dr. R. D. Thomson’s opinion on the sanatory question, and states that the Doctor’s remarks are “unfounded and uncalled for,” and his arguments even “ridiculous.”

It is almost needless to observe, that such a startling opinion as that pronounced by Dr. Thomson on the unwholesomeness of these waters, so opposed to our experience with regard to their use by our citizens, so nauseous and repulsive to delicate and even vulgar minds, and so powerfully incentive of popular excitement, should never have been made without the production of the clearest and most indisputable evidence of its truth. Facts, and experiments of the most conclusive nature, should have been adduced, and mere speculative reasoning scrupulously avoided ; no pains, no labour, spared to confirm or refute such a suspicion if it were forced upon the mind, and every expedient and means that science and art afford applied for the solution of the problem, before so offensive a judgment was even breathed to the public. And if analysis and experience had substantiated the Doctor’s opinion, (which fortunately they do not) the announcement should surely have been made with reluctance and diffidence, and rather suggested than positively asserted.

If the Doctor had displayed more ingenuity and less dogmatism in his reasoning, his judgment might have staggered even the best amongst us ; but the very extravagance of his arguments and language defeats their intention, and exposes

at once to the scientific eye the glaring inconsistency and absurdness of many of the views he strives to establish.

But let us examine more in detail the contents of Dr. Thomson's contribution to the general Report.

I pass over, just now, the preliminary and chemical statements, reserving these for future consideration, and solicit your attention to that portion, beginning at page 15, in which he gives his opinion with regard to the sanatory influence and qualities of the water.

He advances two objections to the use of these waters for drinking. First, because they contain nitric acid; and secondly, because they hold in solution *excess* of lime, especially sulphate of lime. The presence of nitric acid, he asserts, proves that these waters are impregnated with a portion in solution of human excretions, derived from the common sewers and the outlets for the discharge of the waste fluids of our dwellings; and then, at page 18, as a wind up, and to give his reasoning and opinion peculiar pungency and a firm hold upon the imagination, he presents to the Committee the disgusting picture of small-pox matter on a lancet-point! A more unique specimen of inductive philosophy than that comprised between pages 15 and 18, we have never had an opportunity of perusing.

Without denying for a moment that nitric acid is capable of being formed by the oxidation of ammonia, and of azotized animal matter, which is a fact established beyond a doubt or the possibility of dispute, we apprehend it still devolves upon the Doctor to prove (not to assert), that the nitric acid in our well-waters could not have been derived from *any other source* than the one upon which he has given *his* decision. In our opinion the problem, whether the nitric acid existing in these waters has been formed from the animal substances which filter into the earth, or from certain matters in the atmosphere, or from both, remains still unsolved. The Doctor has still to show how azotized matter becomes oxidized in passing from a drain to a well; and he has yet to answer the question, "Whether the conversion of



animal matter into nitric acid does not show that there is some beautiful and merciful process in action, by which its virulent and poisonous nature is completely neutralized and rendered powerless,—by which any noxious matter is, as it were, annihilated or transformed into harmless, and perhaps even useful, products, and the waters of our wells thus kept untainted and salubrious? Mitscherlich states that nitric acid occurs in the wells of the neighbourhood of Berlin; and Berzelius, in his “*Traité de Chemie*,” informs us that this acid is present, in the form of nitrates of potash, lime, and magnesia, in the wells around Stockholm, and may be expected *in all wells that are dug*. Many other distinguished chemists have certified to the fact of the existence of nitric acid in rain, river, and well-water; but it would obviously be affectation, Gentlemen, to refer you to the several Foreign and British chemical authorities, who have investigated the artificial and natural production of nitric acid, who have shown that there are processes unceasingly in operation around us by which it is abundantly formed, and who have expressed their views respecting the beneficial purposes which it serves in the economy of nature.

To insinuate that these waters are unwholesome because they contain a small portion of nitric acid or of nitrate of lime, or because this acid is *derivable* from excrement, is downright nonsense. As well might it be affirmed that our potatoes, corn, cabbages, &c. are unfit for food because they derive some of their ingredients from guano and other animal manures, or their charcoal perhaps from the product of animal respiration. The reasoning is similar to that employed some time since by an English Bishop, when advocating the judicious and moderate use of spirituous liquids, and speaking against total abstinence. “Alcohol (the intoxicating principle of common spirituous liquids) contains,” he says, “the same elementary ingredients that are found in bread, and therefore it is as useful and beneficial, when properly used.” So much for a Bishop’s chemistry!

If our well-waters contain human excretions, surely we

ought to detect the presence of the leading ingredients of these matters. Now, unfortunately for Dr. Thomson's opinion, nitric acid is not a normal ingredient, under any circumstances, of animal excretions, nor is it a product of the vital actions of the living organism. Nitric acid, when combined with lime or any other base, and largely diluted with water, is not poisonous or hurtful; and the Doctor, I am sure, will not venture to say that the presence of two grains of nitric acid (the average quantity found by himself) in a gallon of water renders it unwholesome or poisonous. And if, then, nitric acid is not hurtful, and is not a constituent of excretions, I ask, What is it? The answer is clear,—harmless and insignificant.

If the Doctor was anxious to prove the contamination of our wells with human excretions, he ought to have shown in his analyses a decided preponderance of the leading and most marked ingredients. Among the chief ingredients, the most striking are, animal matter, ammoniacal salts, and phosphates; but it is a very singular circumstance, that on these substances the Report of Dr. Thomson is silent, and even, according to Dr. Penny's analyses, the quantity of organic (animal and vegetable) matter is extremely minute, and does not amount to one grain per gallon in five of the six samples analyzed by him, a quantity very far less upon an average than the Clyde water contains. On referring to the recent and minute analysis by Mr. G. F. Clark, we find that Thames water, (with which London is partly supplied,) taken from the river twelve miles above London Bridge, and above the influence of the sewers, contains 3·47 grains of animal and vegetable matter per imperial gallon. The deep well-water of London, according to the experiments of Messrs. Abel and Rowney, at the Royal College of Chemistry, contains  $\frac{9}{10}$  of a grain per gallon.

Ammoniacal salts and phosphates are not mentioned in either Report, and therefore I infer that there is no appreciable amount of these essential ingredients of human excretions present in the water, for they would certainly not have



escaped the analytical acumen of Dr. Penny if any hurtful quantity existed therein; and even supposing them to be present, it is no proof that they come from excretions, as nearly all natural waters contain a small admixture of these salts, derived from the atmosphere and the rocks or strata with which the water comes in contact. The proportion of animal and vegetable matter in the sewer-water of Glasgow, as determined by actual experiment, amounts to 50 per cent. of the solid ingredients; and yet, on consulting Dr. Penny's report of the solid substances in our well-waters, we observe that the average quantity is only 1·3 per cent.

And now, Gentlemen, let us contemplate Dr. Thomson's second horrible phantom in our wells,—“lime, especially sulphate of lime.”

Every tyro in chemistry knows that lime is an essential constituent of our bodies, existing in our blood, bones, and teeth, and found pervading nearly all the fluids and solids of the human frame. It is well established, that the lime which our bodies contain is derived from external sources, *i. e.* our food, in which it exists, ready for our exigencies, in different states of chemical combination, as phosphate, carbonate, sulphate, &c. Without this substance our solid framework could not be built up,—we could not exist; and hence we find that our beneficent Creator has not only supplied us with a liberal hand, but has diffused it through almost every article of food of which we partake. In bread, milk, meat, eggs, potatoes, &c. &c. we have lime, and why not in water? I assert, without fear of contradiction, that all natural waters ordinarily used by mankind contain lime: it is (in chemical combination) one of the ingredients which give to water its peculiar and palatable flavour. Rain-water and distilled-water (the pure water of the chemist) are disagreeable, and even sickening, when taken in quantity: in these we have no lime. Where shall we find the river, or spring, or well-water free from lime? And who will be so presumptuous as to assert that this is a needless provision of the Almighty? or not for some wise purpose, even as regards our own bodies?

"Let no presuming impious railer tax  
 Creative wisdom,—as if aught was form'd  
 In vain, or not for admirable ends.  
 Shall little haughty ignorance pronounce  
 His works unwise, of which the smallest part  
 Exceeds the narrow vision of her mind?  
 As if, upon a full-proportion'd dome  
 On swelling columns heav'd, the pride of art!  
 A critic-fly, whose feeble ray scarce spreads  
 An inch around, with blind presumption bold  
 Should dare to tax the structure of the whole.  
 And lives the man, whose universal eye  
 Has swept at once the unbounded scheme of things,  
 Mark'd the dependance so with firm accord,  
 As with unfalt'ring accent to conclude  
 That this availeth nought?"

But the Doctor says, "excess," "quantity." It is at once granted that the well-waters of Glasgow contain a considerable proportion of lime salts; but I humbly submit that the quantity is not extraordinary or "excessive," and that the water is not rendered thereby insalubrious or unfit for drinking. It is a pity, for the sake of science, that the Doctor did not condescend to state what he considers to be the precise limit of "excess." Are we in a worse position than the inhabitants of other populous towns? Mr. Lewis Thompson tells us that the wells in the neighbourhood of Paris are saturated with sulphate of lime, holding in solution 110 grains per gallon, (which are equal to  $45\frac{5}{10}$  grains of "lime,") besides the lime which exists as carbonate. These waters are freely used as a beverage by the inhabitants. The total quantity of lime in our well-waters, according to Dr. R. D. Thomson, is about 15 grains per gallon. How awfully afflicted with *gravel* and *stone* the inhabitants around Paris ought to be, according to the reasoning of the Doctor; and yet Mr. Lewis Thompson tells us, "during a residence of some years in these parts, I have never seen or heard of any disease peculiar to the inhabitants."

Again: look at the Thames water. Richard Phillips, Esq., in his evidence before a select committee of the House of Lords in 1840, states that Thames water contains about 17

grains of carbonate of lime per gallon, equivalent to  $9\frac{1}{2}$  grains of lime; and that the New River water, from which also a considerable supply is taken for the metropolis, holds in solution nearly the same amount of lime, in addition to about four grains of carbonate of lime and common salt. Numerous other cases might be given, if it were not for overburdening this letter with details. Those who have visited the south of England, where chalk abounds, as Brighton, Gravesend, Margate, &c., well know the remarkable "hardness" of the well-waters there, from the presence of lime; and yet how palatable and agreeable for drinking, although unsuited for other purposes.

I now come to another point of great seriousness connected with a part of the question, and certainly the most startling and novel announcement in Dr. T.'s Report,—that "lime is frequently the cause of gravel and stone." Oh, blush, ye members and cultivators of medical science, for your grievous ignorance! Well may the writer of the accompanying Letter say, that "it needs no ghost to tell us that lime, or any thing else, *in excess*, is objectionable;" and that to ascribe calculi to lime, "is to mistake the cause for the effect." Rather a serious charge, I apprehend, against a physical and medical philosopher! With equal truth it might be said that sugar is the cause of diabetes, that eggs produce disease of the kidneys, or that the eating of common salt occasions chalk-stones in the joints of old people, because these concretions contain soda. Dr. Thomson's assertion would naturally lead the uninitiated to conclude that lime calculi are the most frequent; whereas it is well known that the most abundant and common are those of lithic acid, and the peculiar diathesis which accompanies the formation of lithic acid calculi is the reverse of that which obtains when lime concretions are formed. How lamentably opposed to all experience and knowledge are the opinions of the Doctor! Lime itself has been used, and by some extolled, as a remedy or agent for the relief of calculous disorders, and at one time possessed considerable celebrity as a lithontriptic. It was

the active ingredient of Miss Joanna Stephen's "receipt for the gravel and stone." This lady had acquired great fame by her mode of treatment, and she offered to disclose her remedies on payment of a suitable reward. A committee of medical men was appointed to investigate the matter, and their report was so favourable, that Parliament made a grant of £5000 to the lady. Now the essential ingredient in her mixture was lime, prepared from egg-shells and snails, mixed with several aromatic herbs. True, the boasted remedies were found to have no power to dissolve or remove the calculi when once formed; but we have abundant medical evidence to show that temporary relief was afforded, and we have the experiments and statements of Chevallier, and other authorities, that lime is beneficial in certain calculous diseases. My object, however, is not to discuss whether it is or is not serviceable: more certain, manageable, and efficient remedial agents are now in the hands of the profession for the mitigation of these most painful afflictions; but I submit that the employment of lime, at any time, shows the falsity or carelessness of the declaration that "it is frequently the cause of gravel and stone." Here, perhaps, the Doctor will exclaim, "sulphate of lime is perfectly useless for such an object," and I will grant him the full force of his objection,—nay, more; I will assert, in common with himself, that lime in combination with sulphuric acid, or any other mineral acid except perhaps the carbonic acid, is not in any way admissible as a remedy in these complaints. "Sulphate of lime," however, is no more the cause of gravel and stone, than lime. It is not a marked ingredient of any calculus, nor is it ever deposited as a sediment from urine.

The well-waters of Glasgow undoubtedly contain a large proportion of this lime salt,—about 22 grains in the gallon. Does such a quantity render water unwholesome or poisonous? If an answer or opinion be given affirmatively, where is the evidence? Mere speculative reasoning, vague assertion, or a strained impulse of the imagination, should not be permitted to decide so important a question.



Sulphate of lime has never hitherto been condemned as pernicious to animal health or existence. I have shown it cannot be deleterious on account of the lime which is present in it, and we have no evidence to show that its other ingredient, sulphuric acid, (in chemical combination,) is incompatible with a healthy state of the animal body. The well-waters near Paris contain  $64\frac{7}{10}$  grains per gallon of combined sulphuric acid; those of Glasgow, taking Dr. T.'s numbers, 13 grains. Professor Graham gives 13·7 grains per gallon, in the deep well-waters of London; and the water of the Artesian wells, Trafalgar-square, London, analyzed at the Royal College of Chemistry, gave 11·2 grains per gallon; and if occasion demand, it would be easy to draw up a copious table, showing that many of the waters used by mankind contain as much sulphuric acid (in combination) as the well-waters of Glasgow, and in very many instances more.

If, then, the leading or most remarkable ingredients of these waters, (*viz.* sulphate of lime and nitric acid,) are not hurtful or noxious; if the quantity of animal or organic matter present is a mere trifle, and not pernicious,—what can justify Dr. Thomson in branding them as a solution of human excretions? or in putting them into the same category as the virulent small-pox matter on a lancet point?

The present case of difference of opinion is precisely analogous, so far as it has gone, to what happened when the Gorbals Gravitation Water Company was in progress of formation. The discovery of a source whence an abundant supply of pure and wholesome water, suitable for all purposes, could be obtained, was obviously of the first, and of vital importance. Among other streams, the Brock Burn, from which the supply is now taken, was examined, and samples of the water sent to two chemists for analysis and judgment. One chemist reported, as the result of his examination, that he had seldom met with such pure water near a large town; while the other affirmed, to the effect, that it was very bad, and quite unfit for domestic use; and added, there was no water near Glasgow so pure as that of the Clyde. The source of the



samples was made known to the chemists. In this dilemma the assistance of another chemist was called in, and fresh samples were forwarded to each party, and, very wisely, this time the source was not named to the previous dissentient. The three reports were submitted to Parliament, and were most favourable: all agreed that the water was remarkably pure, suitable for all purposes, and wholesome, and if supplied to a town, would certainly be a very great benefit to the inhabitants using it. Thus the Company were prevented from sacrificing a valuable source of supply, and by overcoming this blight, which threatened to nip the undertaking in the bud, the spirited directors and secretary have perseveringly developed it to its present brilliant and efficient position. These are facts, and "facts are stubborn truths." Oh, the blighting and perverting influence of prejudice, and of hastily-formed opinions! Those who know the most, well know how very little the most enlightened know.

It cannot be expected, Gentlemen, that your valuable time will allow, even if your pursuits qualified you, to enter into a minute examination of the chemical results and statements given in Dr. Thomson's Report, and I might therefore be naturally expected to pass over this part without comment or discussion. Lest, however, my silence might lead to the inference that in this portion, at least, of his evidence, the Doctor is faultless and trustworthy, I feel it my duty to crave your patience while I direct attention to the most prominent defects of the Doctor's chemistry.

At page 8 Dr. Thomson states, "We should not expect the presence of potash in the waters derived from the neighbourhood of Glasgow, as the rocks themselves contain soda." Now why prejudge and decide an important scientific position in this vague manner, when two or three hours of careful and skilful experimenting and testing would have established or refuted it? Will the Doctor undertake to say that the rocks, strata, and soils in the neighbourhood of Glasgow contain no potash? Are the crops and plants around us destitute of this important fertilizing substance? When the

Doctor made the above statement he surely had not seen the account of the experiments by Professor Kuhlmann on the existence of alkalis in nearly all our common minerals and rocks. Dr. Penny tells us the waters in the public wells contain potash; and by way of satisfying myself, I subjected a considerable quantity of the water from one of the wells to a rigorous analysis, and I found a decided and an appreciable quantity of potash; and I am sure Dr. Thomson would have obtained a similar result, if he had performed an experiment instead of relying on his speculative opinion,—unless, indeed, he determine alkaline matter by calculation, as we are told at page 13. If he maintain the absence of potash from the well-waters, he obviously refutes himself with regard to their containing human excretions, because potash is a marked and very soluble ingredient of these matters: it is present in sewer-water, and should therefore be found in his well-waters.

Again: at page 10 we are informed that the solid matter, obtained by evaporating the several samples of water, was dried at a temperature of 350° Fahrenheit. The application of so high a heat in the present instances gives an erroneous result, as a portion of the solid matter is expelled and lost. We would advise the Doctor to study the action of muriate of magnesia on nitrates and carbonates, and he will learn what we mean. True, the amount of error is small; but a palpable chemical mistake of this sort inevitably awakens a feeling of distrust and uncertainty with regard to other determinations, and suggests the inference that his methods may be otherwise faulty. At page 12 he gives, in a very general form, the quantitative results of his analyses; and here again I am pained to observe incompleteness, and insufficient data for the formation of an accurate opinion. Why is the magnesia omitted? Is its amount too minute or insignificant? On turning to Dr. Penny's analyses, I find a notable quantity reported. Surely such an omission is neither scientific nor usual. I beg the Doctor's pardon: at page 13 *a reason* for neglecting the magnesia is given. In the first sen-

tence of this page he writes, "The amount of alkali has been omitted, as it is obtained by calculation; and also the magnesia, as they do not interfere with the value of the water, either as a detergent or as a beverage." It is not easy to conceive a scientific chemist venturing to make two more erroneous and incautious statements than are contained in this sentence. The determination of every ingredient in water, and in almost every thing else, involves more or less of arithmetical calculation, founded on the data afforded by previous and carefully-executed analyses; but to say that alkali is "obtained by calculation, and therefore not worthy of insertion," is to state what is not true as regards the methods and practice of other chemists. If we examine the elaborate analyses of water recently presented to us by Graham, Clark, Collonet, O. Henry, Kersten, Morin, and a host of other analysts,—nay, if we consult the elementary works on chemical analysis by Fresenius and Rose,—we find ample evidence that such is not the practice among modern qualified experimenters, whatever may be that of Dr. R. D. Thomson. If, indeed, such is the method of his procedure, we have at once a clue to a remarkable difference between a report from himself, and one from another analytical chemist on the same sample of commercial "muriate of potash." The Doctor reported 91·8 per cent. of pure "chloride of potassium," while the presence of common salt was omitted to be mentioned; the other chemist gave 81 per cent. of chloride of potassium, and 10½ per cent. of common salt. On reference to another chemist, the report of Dr. R. Thomson was found to be inaccurate and false, and it was easy to prove, by a simple process, that common salt was abundantly present. Such is the result of "calculation" when opposed to exact experimental determination. How I pity the purchaser of this salt, if he bought the bulk believing it to stand at nearly 92. It would certainly be a novelty if Dr. Thomson, or any other chemist, could produce a sample of *commercial* muriate of potash free from common salt.

The second statement in this sentence is not more fortu-

nate; viz. "that magnesia does not interfere with the suitability of water for washing purposes." If the Doctor had ever practically examined the action of soap on solutions of magnesia, or even of some alkaline salts, he would certainly not have dared to pen such a sentence as the above. Let me advise him to wash his hands with soap, in water containing a little Epsom salt or muriate of magnesia, and he will learn a practical lesson which will speedily dispel his present notion,—that magnesia has no deteriorating or curdling action upon soap. I strongly advise him to study carefully and elaborately the rationale of the action of pure water, and of water holding magnesian, calcareous, and alkaline salts in solution upon soap, before he ventures again to express an opinion regarding the ingredients or matters that give the quality of hardness to water. The Doctor correctly states that "the hardness of water is exhibited by the curd which soap forms when dissolved in it;" but he errs when, further on, he ascribes this peculiar hardness solely to the lime in the water; and therefore the estimates which he gives of the comparative hardness of several samples are made on an inaccurate basis.

I trust, Gentlemen, you will not misapprehend my statements. I fully agree with Drs. Penny and Thomson that the well-waters of Glasgow are *very hard*, and contain a large quantity of saline matter in solution, and consequently are not suitable for washing, for making tea, coffee, &c., for steam-boilers, and, in a word, for any purpose where the use of hard water is interdicted. And I also admit, in common with these authorities, that the waters of our public wells are very much less pure than those of the Clyde and Brock Burn. To decide whether it would be better to supply the poorer classes of the community with Clyde water exclusively, requires a more extensive and competent inquiry than we have as yet had. They need no Dr. Thomson to tell them that the waters of the wells are unfit for washing, and many other domestic purposes. Their experience has long since taught them these simple facts; and I am much mis-



taken if the inhabitants generally, both rich and poor, would not at any time prefer to *drink* the water from a properly located well than that of the Clyde, with the yellow colour and floating unsightly impurities with which it is frequently supplied for our use. Neither the experiments nor the pretty pictures of Dr. Thomson will ever, I fear, induce even a poor man to swallow a suspicious, yellow, and turbid liquid, when he can obtain a bright, clear, palatable, and colourless water from a well, although the latter may contain *a few grains per gallon* more of gypsum, common salt, and chalk. The Doctor has surely formed a very low estimate of the common sense and knowledge of his fellow-citizens. I admit, then, the presence of saline ingredients in our well-waters, but I maintain that Dr. R. D. Thomson has given his opinion on the sanatory influence of these waters upon inadequate and imperfect data. He has made statements opposed to the experience and knowledge of men of science; his experimental results are incomplete and crude; and he has failed altogether in showing that the water contains the predominant ingredient of human excretions. I further submit, that the nitric acid present is harmless and insignificant; that the sulphate of lime, so far from being injurious and objectionable, may more reasonably be conceived to be serviceable to the human body; and that salts of potash do exist in the waters of Glasgow. And I say, the Doctor is guilty of an absurdity when he states that lime is frequently the cause of gravel and stone; he is mistaken when he asserts that magnesia does not interfere with the value of water as a detergent; and he is not sufficiently precise when he affirms the expenditure of soap, in washing, to be according to the amount of lime in water. I should be sorry to be condemned as hypercritical. A public document, however, should be clearly and cautiously worded, admit of no ambiguity, founded on fact, and easily comprehensible. Precision of expression and explanation, as of manipulation and analysis, is imperatively demanded and expected whenever chemistry, or any other of the useful sciences, is brought to bear upon important public



and practical problems. The contrary may not be grievous or fatal, and may escape detection; but where experience and well-established facts give the power to be exact, it is careless and censurable to be otherwise, and the reserve that would gloss over or hide the existence of such a defect is pusillanimous and culpable.

And here, Gentlemen, I could pleasurably take my leave of the Doctor and his contribution to this Report, although I am strongly tempted to advert to several other apparent inconsistencies and, I fear, hasty remarks; but I cannot omit to notice the Doctor's amusing little drawing at page 9, given to illustrate the manner in which "water gets into a well." If he had been writing a book for the instruction of little children, it would have served the object very well; but to present so puerile an attempt to a committee of intelligent and educated men, was surely somewhat hazardous. Besides, it fails to represent the true arrangement of matters, and clearly indicates that the Doctor has never inspected the practical operations, or the results, of sinking a well in Glasgow. Let him consult the journal of an experienced well-digger, and see the beds of clay, sand, tile, limestone, fire-clay, &c, through which the bore or shaft is sunk, and he will henceforth be more exact. If we are to take this as a specimen of his teaching powers, we fear there is much need of improvement.

Such then, Gentlemen, is the general nature of the evidence presented to you by Dr. R. D. Thomson on the chemistry and sanatory influence of our public wells. I have a very high opinion of his ability and cleverness in getting up a paper or report on any scientific subject. His "British Annual," his numerous contributions to the London periodicals, and his varied papers to the Philosophical Society of Glasgow, show peculiar aptitude in this respect. He has not been many years with us in the position which he at present occupies, but he has praiseworthily exerted every effort to bring himself into notice as an assiduous cultivator of chemical science; nor should it ever be concealed that

he has certainly conferred a great boon upon those who are desirous of becoming acquainted with the practice of the science, by making the fee for laboratory attendance in the College less than that in any other recognised practical establishment in Great Britain,—thus boldly advocating the opinion that low fees are not inconsistent with Academical Institutions. Whether the dignity of the profession, or of any institution, is well maintained by such a course, I leave others to decide. With the guidance and assistance of his illustrious uncle, Dr. Thomas Thomson, he has the power of accomplishing much for the advancement of science, and the scientific world has every right to anticipate some profound and original investigations at his hands. But I hope he will not feel hurt when I venture to remind him, how little the boldness of assertion and the uncertainty of crude experiments contribute to the purpose for which chemistry is cultivated; how little the discovery of truth is promoted, and the influence of science supported, by hastily-formed opinions and specious arguments.

Startling comparisons, flights of fancy, and confident decisions may interest and amuse for an evening the members of a scientific society, or raise the wondering admiration of the young and uninitiated; and perhaps the Doctor may have contracted his habit of writing more by aiming at momentary effect, and by mixing with those of youthful age, than by subjecting his opinions to the scrutiny of those who have had more opportunities of acquiring practical knowledge, and more successful methods of communicating their views and researches. If his fondness of appearing in print would suffer him to take as his model those distinguished men who have adorned this department of science, he would learn in time to reason rather than assert, and to prefer scrupulous correctness of experiment and an accurate application of facts to mere speculative gossip, which may disturb the imagination for a moment, but produces no permanent effect upon the mind.

On the third part of this pamphlet, containing Dr. Penny's

Report, I have but few remarks to offer. It is manifestly the production of a scientific man, and one well trained in the minutiae of practical analysis. Its contents are strictly of a scientific character; it is comprehensive and comprehensible, and contains every chemical particular required to be known respecting the water analyzed by him. The several peculiarities are clearly pointed out, and the purposes for which it is not suitable fully stated. At the same time, Dr. Penny's opinion cannot be held as deciding the point with regard to the wholesomeness or unwholesomeness of the other public wells. If I rightly understand the matter, the Doctor made an analysis of six samples of water, sent to him in jars labelled with letters; and he appears to have reported favourably on their suitableness for drinking, in consequence of his not detecting the presence of any deleterious substance. His judgment is evidently founded on the actual results of his experiments and analyses, and being, as he states, in ignorance of the localities of the wells from which the water was taken, he very judiciously abstains from conjectural and useless speculation on the origin of the several dissolved ingredients. I think it is to be regretted that the Committee did not make known to the Doctor the several sources whence the samples were obtained; and, doubtless, we should have had a more elaborate and decisive Report, had he been requested to make a general examination of all the wells in Glasgow, to select and draw his own samples, and to give his opinion upon them separately and generally. I have been told, though I hope my informant is in error, that the water forwarded at first to the Doctor was sent in improper jars, and was consequently refused and returned. I applaud his caution in not attempting to account for the source of the nitric acid in the waters, when he was kept in ignorance of the situation of the several wells. And while the Doctor's name is before us, I cannot resist expressing the hope, although irrelevant to the purpose of this letter, that he would devote himself more completely to original research, and occupy himself less with the routine

of lecturing and commercial analysis. He began his scientific life as an original investigator, he has a powerful and an original mind, and his papers to the Royal Society of London gave ample promise of more extended and profound investigations. Perhaps I am anticipating that which in the mean time is scarcely practicable, not being aware of all the circumstances relating to his connexion with the Andersonian Institution, where, as we have been told by Blackwood, "the professors are kept at the starving point to make them keen."

And now, Gentlemen, allow me, in conclusion, to urge upon you the necessity and importance of having the condition of these wells thoroughly investigated, and the suitability of the waters for public use scrupulously tested and established. Some of them may be improperly located, or need repair and improvement; but let not all be branded with unwholesomeness and filth, and condemned by the fanciful and ill-timed speculations of an ingenious theorist. Let those that are good be preserved and used, and the bad be selected and closed, for surely it is far better that a few should be even unnecessarily shut up, than that all should be sacrificed. The citizens of Glasgow, whose interest and welfare you so efficiently and carefully protect, have a right to claim a full and competent inquiry at your hands; and I, for one, resign the subject into your charge, with a well-grounded confidence and hope that neither the pressure of authority nor the confidence of assertion will deter you from determining according to truth and justice.

JUNIUS.

*Glasgow, August 1848.*



*To the Editor of the Pharmaceutical Times.*

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SIR,

In the *Pharmaceutical Times* of the 8th instant, I am sorry to perceive the really practical and interesting paper of Dr. R. D. Thomson on the "Wells of Glasgow" is concluded by some theoretical observations equally unfounded and uncalled for. In speaking of the "influence of the foreign substances in well-water upon human health," Dr. Thomson makes the following sweeping assertion:—"If a substance is not necessary to the human system, its omission from the food is a judicious, if not an imperative, proceeding." Does Dr. Thomson mean by this, that nothing should enter into the composition of our food except that which can be taken up into the system? Such an argument is ridiculous. Nature has provided us with a digestive apparatus capable of selecting or rejecting such parts of our food as may or may not be fitted for the animal economy, and it would be neither judicious nor safe, nor, indeed, practicable to omit from our food those parts which nature accepts or rejects according to the necessities of the moment. What Dr. Thomson should have said is, that if a substance is injurious to the human system, its omission from the food is a judicious, and, indeed, an imperative necessity. Dr. Thomson next remarks, that in the Glasgow well-water "sulphate of lime is an abundant constituent, but it is not required by the animal economy." Perhaps as sulphate of lime it is not required; but as sulphur, oxygen, and lime, it is indispensably necessary to the constitution of bone, blood, and, indeed, every tissue of the human body; and to assert that it is incapable of assimilation and decomposition would, I think, be a somewhat hazardous line of argument. That this substance is decomposed with facility, is shown by the fact that water contain-



ing much sulphate of lime and organic matter when exposed to a temperature exceeding 70° F. gradually ferments, if I may use the word; the sulphate of lime and organic matter re-act upon each other, sulphuretted and carburetted gases are given off, whilst carbonic acid and carbonate of lime remain in the water, which is now no longer susceptible of decomposition, but has become a pleasant, and, as experience shows, a wholesome beverage.

That sulphate of lime is not decidedly injurious, is proved by the condition of the inhabitants around Paris. The water in the wells of Montmarte, the Batignolles, Clichy, le Vallois Thernes, Champ Peray, and, indeed, for many miles round Paris, is saturated with sulphate of lime, and contains on an average 110 grs. per imperial gallon; but, during a residence of some years in these parts, I have never seen or heard of any disease peculiar to the inhabitants; yet, as a medical man and free drinker of this water, its injurious qualities, supposing it to possess such, could hardly have escaped my observation. Dr. Thomson next asserts that "lime in all forms, when used in excess in the food, is highly objectionable, as it is very frequently the cause of gravel and stone." "There needs no ghost" to tell us that lime or any thing else used *in excess* in the food is highly objectionable. Sugar or common salt, we presume, *in excess* would be highly objectionable; but that lime is frequently the *cause* of gravel and stone, is an assertion wholly devoid of foundation. As well might it be said that sugar is frequently the cause of diabetes, that Epsom salts produce triple phosphate, or that the eating of eggs brought on an attack of albuminous urine, as that lime was in any way the cause of gravel and stone. This is to mistake the effect for the cause. The peculiar diathesis which leads to the formation of stone and gravel has no more connection with lime than with any other substance, and the proportion of calculi containing lime is by no means great. Nature has nowhere supplied us with pure water, nor has she given us a taste for this article, which is not pleasant to the palate, and produces a feeling of weight and oppression on the stomach. Well or spring water, on the contrary, is pleasant and agreeable; in all ages and under all circumstances it has been sought for, fought for, and extolled, both in verse and prose, as something of the highest importance to mankind. That its peculiar and agreeable properties depend upon carbonic acid, and

some of the salts of lime, is unquestionable; and I am inclined to believe that the bicarbonate is that salt, without which water is tasteless, vapid, and scarcely wholesome as a beverage.

I am, sir, your obedient servant,

LEWIS THOMPSON.

*Byker Bar, Newcastle-on-Tyne,*

*July 14, 1848.*

NOTE.—Since the foregoing letter was in the press, I have seen in the Glasgow newspapers the letter addressed by Dr. R. D. Thomson to the Lord Provost in answer to the remarks made by Councillor Bryson on the value of the Doctor's medical and scientific opinion. This letter is in every respect consistent with the Doctor's usual practice on similar occasions, and it certainly does credit to his skill in making out a case. He feels as he ought to do for his medical reputation, and expresses himself in the warm and plaintive language of an injured man. In any other cause I doubt not the Doctor would have cautiously weighed the consequences of appearing in such a position before the public. But here, I presume, he thought it would be a breach of his rule, *to appear as often as possible in print*, to lose one moment in consulting his understanding. The medical opinion that trembles and frets at a Councillor's judgment, may well implore and require the mediation and support of the Lord Provost; but the public, I imagine, will not be slow in discovering the condition of mind and feelings which led the Doctor to relate his pathetic story. The Doctor adduces a part of a testimonial from the distinguished Dr. Farr. He should know, by this time, that the production of private testimonials is *lightly* estimated, and I need not remind him in what class of the community those who use them are generally ranked.

It is very evident that Dr. R. D. Thomson has gathered the opinion with regard to the contamination of our public wells with

filterings from the sewers, from the experiments and reports long since made on the state of some wells in London and Manchester; and it is to be truly regretted that the Doctor did not imitate the caution and scrupulous exactness of the scientific men who were engaged with these investigations.

I cannot omit, before I leave the subject, to notice the significant postscript which is appended to Dr. R. D. Thomson's letter, and one which will undoubtedly give more gratification to his enemies than pleasure to his friends. The crime of being "antiquated," which the Doctor has therein so sneeringly charged upon Mr. Lewis Thompson requires neither palliation nor denial. A sneer too often betrays either the influence of vanity, or the conviction of defeat. Whether entertaining sound and well-established "physiological principles" can be attributed to any man as a reproach, I will not assume the province of determining; but surely "young chemistry" may become justly contemptible, when it struts and flourishes with feathers plucked from the plumes of Liebig, Bous-singault, and other able philosophers.

*"Miserum est alienæ incumbere famæ,  
Ne collapsa ruant subductis tecta columnis."*

It may be despised when it exalts itself to a degree of authority never yet assumed by our most distinguished physiologists, and when it attempts by a jeer to palliate, and escape from, the charge (made by a clever chemist and an experienced physiologist) of using "arguments that are ridiculous," of mistaking "the effect for the cause," and of making assertions "wholly devoid of foundation." The Doctor appoints the "youngest pupil of the Institutes of Medicine in our College," as the umpire for deciding the points in dispute between himself and Mr. L. Thompson: such an appointment does honour to the Doctor's general method of subduing a difficulty. A contemptuous postscript, let it be ever so well expressed, will never conduct a man honourably or successfully through a scientific controversy. "Like bad money, it may pass current for a time, but it will soon be cried down." It cannot consist with the true spirit of philosophy, though it may be sometimes united with extraordinary qualifications. I hope the Doctor will yet undertake to answer the charges that are made against him; and I sincerely wish he may be able to answer well.

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